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PSYCHOMETRIC PROPERTIES AND GENERATIONAL DIFFERENCES IN SELF-
REPORTING ON THE CLINICALLY USEFUL SUBSTANCE ABUSE PROBLEMS
OUTCOMES SCALE

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UNIVERSITY OF RHODE ISLAND

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
PSYCHOLOGY

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2020

DOCTOR OF PHILOSOPHY DISSERTATION
OF
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2020

Abstract

Substance abuse is a growing problem worldwide, and the negative consequences associated with Substance Use Disorder (SUD) impact people across all age groups, but the availability of SUD screening tools that show clinical usefulness across generational differences is limited. Therefore, more research exploring differences and similarities in substance abuse and dependence problems across age groups may provide useful information for future research and clinical work. The present study examines age group differences in substance abuse and dependence behaviors in three main analyses.

First, age differences in abuse and dependence of drug types were examined using Chi-square tests for independence with a sample ($N = 1,620$) who completed Structured Clinical Interviews for DSM (SCID) interviews as part of the MIDAS study at Rhode Island Hospital. Participants reported on whether they abused different drug types (i.e., sedatives/hypnotics/anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens) in the past year. Crosstabulations comparing abuse and dependence of different drug types across age groups (i.e., ages 18-25, 26-35, 36-49, 50 and older), showed that the middle age group (i.e., ages 36-49) reported significantly higher rates of past-year substance abuse and dependence compared to the other age groups, for drug types including sedative/hypnotics/anxiolytics, cannabis, stimulants, and cocaine. In addition, past-year cannabis abuse appeared to be significantly more prevalent across all age groups compared to other drug types.

Second, the factor structure of a proposed substance abuse problems measure, the Clinically Useful Substance Abuse Problems Outcome Scale (CUSAPOS), was explored with principal components analysis (PCA) and confirmed with confirmatory factor

analysis (CFA) in order to evaluate clinical usefulness in an outpatient psychiatric setting. Results from PCAs showed that the proposed CUSAPOS subscales, which assess for alcohol and drug abuse problems, should be treated as two distinct scales, the Clinically Useful Alcohol Problems Outcomes Scale (CUAPOS) and the Clinically Useful Drug Problems Outcome Scale (CUDPOS), each with two factors. Both scales show one factor that appears to describe the level of one's insight regarding their substance abuse problems, and the other factor assessing for behavioral consequences of substance abuse problems. The factor structure for each scale was confirmed with CFAs examining overall goodness of fit. Multigroup CFA was used to test for invariance of participant responses to these scales across four Age Cohorts including Young Adults (ages 18-25), Adults (ages 26-35), Middle Age (ages 36-49) and Older Adults (ages 50 and older). Results showed that both the CUAPOS and the CUDPOS are non-invariant, suggesting that there may be meaningful differences in the way participants in different age cohorts interpreted and responded to the proposed items in each scale.

Third, after confirming the factor structure of the two distinct scales and establishing that they are both non-invariant across Age Cohorts, differences in participants mean scores were examined between Age Cohorts for both the CUAPOS and the CUDPOS with Analyses of Variance (ANOVAs). Confounding variables that potentially influence relationships between age and alcohol or drug abuse, including Race, Gender, Mood Impairment, Attention Deficit Hyperactivity Disorder (ADHD), Self-Injury, and Childhood Trauma were analyzed using ANCOVAs and two-way ANOVAs. ANOVA results showed that the CUAPOS showed no significant differences in mean scores between Age Cohorts, however an interaction effect between Age Cohort

and Race showed that the Young Adult, Persons of Color, group reported significantly less problems than the rest of the Age Cohort and Race groups, whereas the Middle Age, Person of Color group reported significantly more alcohol problems compared to the other groups. The CUDPOS showed significant differences in the mean scores between the Young Adult group and the Middle Age and Older Adult groups. Gender was found to have a significant main effect on CUDPOS scores but showed a nonsignificant interaction effect with Age Cohort. Overall, results showed that the only significant covariate influencing the relationship between the participant responses on the CUDPOS between Age Cohorts was Childhood Trauma. Implications of these findings and study limitations are discussed, as well as suggestions for future research further exploring relationships between age and substance abuse and dependence.

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I would like to take this opportunity to thank so many who helped me along my path to achieving this important life goal. First, if it were not for the tireless efforts of the clinicians and researchers who work on the MIDAS project at Rhode Island Hospital, I would not have the data to explore the research questions for my dissertation. I am so grateful to Dr. Mark Zimmerman, and Dr. Kristy Dalrymple for allowing me to use their 2014 MIDAS project data. I give special thanks to Dr. Dalrymple who was so kind and supportive any time I reached out for her guidance, as one of my committee members. I would also like to thank Dr. Phillip Clark, who provided expertise on geriatric health and the lifespan approach. His guidance helped me to contextualize my research findings and consider practical applications of these findings in clinical practice. I also want to show my gratitude to Dr. Andrea Paiva, who helped me to better understand the nuances related to the statistical methods I chose to use in this dissertation. I am so grateful for her willingness to take time out of her busy schedule to guide me in completing the final details. I would also like to thank Christina Schulz for providing her expertise and innate teaching abilities, as a Quantitative Consultant, under the supervision of Dr. Lisa Harlow. Christina provided the right balance of guidance and resources for self-study that allowed me to understand my methodological decision-making and research results at a much deeper level.

My major professor, Dr. Mark Robbins, always believed in me and his support has been an invaluable source of inspiration throughout the years of work toward completing my doctoral degree. He always made time to meet with me and remind me of what I am capable of, even on my worst days of dealing with “imposter syndrome.” He

provided invaluable words of wisdom that I will continue to keep in mind as my career progresses, with one of my favorites being “I don’t know if you will succeed but I do know that not trying leads to a 100% chance of failure.” Dr. Robbins inspired me to continue pursuing my dreams no matter how many obstacles may try to get in my way, and I am forever grateful for his mentorship. I also want to thank Dr. Ellen Flannery Schroeder for having such a tremendous impact on my clinical training. She shaped my clinical values and laid the foundation for the mental health work I do every day. I can’t thank her enough for her guidance throughout the years. I also want to thank the URI Graduate School for being so understanding and supportive over the past few years of completing my degree requirements. Dr. Brenton DeBoef and the URI Graduate School staff truly care about the wellbeing and success of their students and I am so grateful for their guidance through this process.

There were several twists and turns throughout a long journey to completing my doctoral degree, and through it all, my family and friends were there to cheer me on. I am so grateful for my parents, Donald and Theresa Sorensen, who always support my dreams and trust my decisions. My sisters, Michelle, Janine, and Elaine, always make me feel unconditionally supported while also holding me accountable to do my best. My husband, Adam, has spent countless nights doing all the household chores and making us dinners, to give me the time and space to balance dissertation writing with my work as an outpatient therapist. He always encourages me to be my best self and I am so grateful to have him in my life. My friends have always provided positive energy that encourages me to achieve my dreams. Jana Shaw-Hedges is a dear friend I met in third grade, and any time I called her with self-doubt about my dissertation writing, she reminded me of

my strengths. She will always feel like a sister to me, and I know that we will always be there to encourage each other to achieve our life goals. I also want to give Dr. Michael Pauldine a special thanks for being a great friend who impacted my academic path tremendously, and always encourages me to pursue any career goal I choose. I am forever grateful to all the family, friends, faculty, staff, and fellow graduate students who have helped me along my path toward completing my PhD in Clinical Psychology.

Dedication

I am dedicating this dissertation to all those who are impacted by the negative consequences of addiction every day. Substance Use Disorder is a pervasive disease that impacts every aspect of daily life, and the individuals who struggle with this disease are true heroes for carrying a burden that so many misunderstand.

“When I stopped living in the problem and began living in the answer, the problem went away.”

— *Alcoholics Anonymous*

Preface

The inspiration for this dissertation project started with my strong interest in Geropsychology, which developed during my undergraduate education. After completing my master's degree in Clinical Psychology at the University of Rhode Island, I searched for my dissertation research questions by learning more about the growing issues in older populations. As I explored the current healthcare concerns related to substance abuse and aging, I grew to understand that Substance Use Disorder may present differently across different age groups. I also learned that substance abuse problems are oftentimes undetected by healthcare providers of older patients, especially in outpatient settings.

My curiosity and concern about the growing issue of substance abuse and aging motivated me to explore this topic in my dissertation proposal. I was extremely fortunate to be accepted into a one-year externship at the Adult Partial Hospital Program at Rhode Island Hospital (RIH), Department of Psychiatry, under the supervision of Dr. Kristy Dalrymple. In addition to her clinical work at RIH, Dr. Dalrymple also works with Dr. Mark Zimmerman and a team of clinicians and researchers on the Methods to Improve Diagnostic Assessment and Services (MIDAS) project. She graciously gave me permission to use the MIDAS project data for my dissertation research. I am so grateful to Dr. Dalrymple and the MIDAS project team for the countless hours of hard work, collecting the data that provided me the opportunity to complete my dissertation and achieve my goal of earning a PhD in Clinical Psychology. This dissertation was written in manuscript format, in preparation for submission to The Journal of Substance Abuse Treatment.

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MANUSCRIPT

Title: Psychometric properties and generational differences in self-reporting on the clinically useful substance abuse problems outcomes scale

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Introduction

Substance Use Disorder (SUD), described in the DSM 5 as “a maladaptive pattern of substance use leading to clinically significant impairment or distress,” is a growing concern in the U.S. population. However, little is known regarding appropriate assessment and treatment of substance abuse problems across demographic groups, particularly in terms of age, race, and gender differences. While valid and reliable substance abuse screening tools exist, many are limited in their ability to describe the nature and severity of substance abuse problems. The present study examines the psychometric properties of a novel substance abuse scale, the Clinically Useful Substance Abuse Problems Outcome Scale (CUSAPOS), in order to evaluate clinical usefulness in an outpatient psychiatric setting.

Substance abuse is a growing problem, and the negative consequences associated with SUD impact people across all age groups; therefore, understanding more about differences and similarities in substance abuse behaviors across age groups, as well as patterns within and between age groups in terms of race and gender differences, may provide useful information for future research and clinical work. Therefore, an additional aim of this study is to examine and describe potential differences in substance abuse problems across age cohorts.

Prevalence and Trends of Substance Abuse and Dependence

Recent reports from the 2018 National Survey on Drug Use and Health (NSDUH), a population-based survey used to assess substance use trends among non-institutionalized U.S. citizens that are 12-years-old or older, showed that approximately 20.3 million survey respondents endorsed past-year abuse of alcohol (14.8 million people, with approximately 11.0 million reporting an alcohol use disorder in the past

year) or an illicit drug (8.1 million people). Past year substance abuse is currently greatest for cannabis use (4.4 million people), followed by prescription pain relievers (1.7 million people) or heroin (0.5 million people). Although the percentage of people with any SUD in 2018 was similar to rates in 2015 to 2017, the percentages of people with alcohol use disorder, pain reliever use disorder, or opioid use disorder were lower than in 2015 (NSDUH, 2018). Lipari, Ahrensbrak, Pemberton, and Porter (2017), explored the implications of perceptions of health risks associated with abuse of different substances including cannabis, cocaine, alcohol, and cigarettes across age groups. They found that across age groups, individuals who perceive a given substance as having low health risk were more likely to develop a SUD with that substance than individuals who perceive the substance as having high health risk. One concern highlighted in this report, is that although perception of risk was high (four out of five people aged 12 or older) for cocaine, heroin, or lysergic acid diethylamide (LSD), the perception of risk for cannabis use was significantly lower (i.e., approximately one third of the sample perceived weekly cannabis use as causing great risk of harm). This perception of low risk associated with weekly cannabis use varied across age groups, with the young adults (ages 18 to 25) being the group that reported the lowest perception of risk of harm from weekly cannabis use (Lipari et al., 2017). It is important to note that the data derived from the NSDUH does not include data from people with no fixed address (e.g., homeless people not in shelters, military personnel on active duty, and institutionalized individuals such as those in jails, nursing homes, mental institutions, and long-term care hospitals) (Lipari et al., 2017). Overall, trends from SUD statistics derived from data from both the United States and globally, show that while alcohol abuse and dependence remains the most prevalent

SUD worldwide, alcohol abuse problems have decreased overall (Seitz et al., 2019). Problems with abuse and dependence of most substances, including alcohol, cocaine, hallucinogens, heroin, and prescription drugs have remained relatively constant over the past decade (Lipari et al., 2017; Lipari & Van Horn, 2017; Seitz et al., 2019). However, the rates of cannabis abuse continue to increase in the U.S. and in European countries (Lipari & Van Horn, 2017; Seitz et al., 2019), as perceptions of the risk of harm from cannabis use continue to decrease over time (Lipari et al., 2017). The risks associated with the low perception of harm continue to rise the most in youth populations (Lipari et al., 2017; Seitz et al., 2019).

Benefits and Limitations of Commonly Administered SUD Screening Tools

Although reports continue to indicate a great need for detection and treatment of substance abuse problems, few adults are asked about alcohol or drug abuse problems in primary health care settings (Pilowsky & Wu, 2012). This is likely since standardized diagnostic interviews can take hours to administer and are typically concerned with highly specific diagnostic criteria at the expense of sensitivity in detection of problems (Carey, 2002). Therefore, the use of psychometrically sound, efficient, screening tools is a necessity for the detection of problems in clinical settings, particularly in the context of mental health care (Carey, 2002). Brief screening tools are clinically useful given that treatment services at many clinical sites are fast paced, with high patient volume in relation to the number of clinical staff (Pilowsky & Wu, 2012). These efficient assessment tools can be used to quickly detect problems which warrant further investigation. Screening tools that are commonly used in busy medical settings, such as the Dartmouth Assessment of Lifestyle Instrument (DALI), the Drug Abuse Screening

Test (DAST), the Alcohol Use Disorder Identification Test (AUDIT), Michigan Alcoholism Screening Test-Revised (MAST), and CAGE questionnaire, are useful in detecting drug or alcohol problems (Hays, Merz, & Nicholas, 1995; Rosenberg et al., 1998; Reinert 2002; Shields, Howell, Potter, & Weiss, 2007; Skinner, 1982; Yudko, Lozhkina, & Fouts, 2007). However, these screening tools have several limitations. For example, these measures are limited in that they assess for either drugs (i.e., the DALI and DAST) or alcohol (i.e., the AUDIT, MAST, and CAGE), and epidemiological evidence suggests that it may be important to assess patients for both alcohol and drug problems (Pilowsky & Wu, 2012; Schuckit, 2006). The World Health Organization addressed this issue by developing a more comprehensive substance abuse screening tool for busy primary care settings, the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (Humeniuk et al., 2008). In comparison to similar screening tools the ASSIST includes more descriptive items and response options (i.e., scaled ratings) inquiring about substance abuse problems experienced within a shorter time frame than similar measures (i.e., three months). There is evidence that these features greatly improve the sensitivity and specificity in detection of substance abuse problems (Humeniuk et al., 2008). Although the ASSIST appears to be an improvement on the screening tools discussed above, it can be argued that a three-month time frame is too broad for accurate assessment of current problems. This is particularly limiting in the context of mental health treatment, given that psychotherapy typically requires more current information for weekly treatment planning and tracking of progress. Therefore, a measure which assesses problems experienced within the past two weeks has the

potential to significantly improve on the currently available substance use disorder (SUD) screening tools.

Consideration of SUD Age Differences

While reports show that SUD is a prevalent issue in younger age groups (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014), trends indicate that there is also a growing need for substance abuse interventions in the U.S. old adult population (Arndt, Clayton, & Schultz, 2011). Although research findings suggest that drug and alcohol abuse is a declining issue in older populations, these results may be misleading. For example, while rates of treatment admissions for primary use of alcohol only have decreased between 1990 and 2010, rates of primary use of illicit drugs and misuse of prescription drugs have increased in older adults (Wu & Blazer, 2011). A comparison of age cohorts of persons 50 to 64 years of age and persons 65 years of age and older, reveals that the shifting trends in the types of substances abused is related to an increasingly high rate of illicit drug use and nonmedical use of prescriptions in the 50 to 64 years of age cohort (Wu & Blazer, 2011). Lifetime prevalence rates assessed in the Monitoring the Future survey appear to coincide with these findings. Eighty-eight percent of 50-year-olds reported trying an illicit drug, which is much higher than reports from previous 50-year-old cohorts as well as reports from current U.S. adults aged 29 to 30 (Johnston et al., 2014). This high rate of lifetime prevalence is largely attributed to the fact that current 60 to 70-year-olds passed through adolescence near the peak of a U.S. drug epidemic (i.e., 1970s-80s) (Johnston et al., 2014). It is also important to note that while annual incident rates of substance abuse (i.e., past-year SUD) tend to decline over the course of one's lifespan (Johnston et al., 2014), the issue of current misuse and abuse

of prescription drugs appears to be increasing the most in women age 50 and older (Wastila & Yang, 2006). Given the strong association between substance use problems and comorbid mood and anxiety disorders (Compton, Thomas, Stinson, and Grant, 2007; Kessler, Chiu, Demler, & Walters, 2005), higher rates of self-reported mood and anxiety disorders in older women compared to older men (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010) may be related to the observed increase in substance use problems in older women. Overall, the current literature has identified female gender, social isolation, depression, and a history of substance abuse as factors that are strongly associated with increased risk for misuse and abuse of prescription drugs in geriatric populations (Culberson & Ziska, 2008). The generational context, during a time in which current “baby-boomers” were adolescents and young adults, is implicated as a key reason for this expected shift in substance abuse trends (Johnston et al., 2014). More specifically, in comparison to their older counterparts, the “baby-boomer” generation was exposed to the U.S. 1970-80s drug epidemic during a developmental period in which they were most vulnerable for developing chronic SUD and associated issues throughout adulthood (Johnston et al., 2014). A social change that may contribute to the rising concern of SUD in older populations is increased prescribing of opioid-based medications, which are highly addictive and potentially dangerous pain remedies (Preda, 2015; Simoni-Wastila & Yang, 2006).

Regarding differences in prevalence rates of the types of substances abused across age cohorts, abuse of psychostimulants appears to be more prevalent in younger age groups (Kaye & Darke, 2012; Kroutil et al., 2005), whereas the association between age and opioid abuse appears to be less clear. More specifically, although there is some

evidence of an inverse relationship between age and a diagnosis of opioid abuse/dependence which indicates that older persons tend to abuse opioids less than younger persons (Edlund et al., 2010), more recent evidence shows that opioid abuse and associated comorbidities tend to increase exponentially with age (Cicero et al., 2012). This suggests that although abuse of opioids may be more prevalent in younger age groups, the negative impacts associated with abuse of these agents are much more severe in older age groups. In addition, it is oftentimes more difficult to assess substance abuse problems in patients who have undergone long-term opioid therapy (Edlund et al., 2010). This problem is a particular concern in older persons because, in comparison to younger age groups, they are less likely to perceive substance abuse as a problem that requires treatment (Wu & Blazer, 2011). This literature highlights the nuanced nature of the current state of drug misuse and abuse in the U.S., and the need for future research that considers the complexity of individual factors that may contribute to one's substance abuse problems.

Relationships Between Behavioral Dysfunction and SUD

It is important to consider the complex mechanisms underlying the relationships between SUD and associated risk factors, as it is well established that psychiatric issues are prevalent among SUD populations (Kessler et al., 2005). There is some evidence that neuroadaptations in stress and reward pathways, as a consequence of the childhood behavioral problems (i.e., depression, post-traumatic stress disorder, and ADHD), may predispose individuals to abuse substances as they grow into adolescence and adulthood (Brady & Sinha, 2005). Childhood events such as sexual and physical trauma as well as the negative social consequences associated with externalizing behaviors of ADHD have

been implicated as key issues that typically precede and confound the neuroadaptations that increase one's risk for a SUD (Brady & Sinha, 2005).

It is well established that there are strong relationships between deliberate self-harm (i.e., intentionally injuring oneself without suicidal intent) and mood disorders such as anxiety and depression (Klonsky, Oltmanns, & Turkheimer, 2003). Of note, these relationships were found in a sub-clinical, general population. Therefore, these associations can be generalized to those outside of the more severe presentations of self-harm which are typically found in psychiatric populations (Skegg, 2005). Additionally, evidence examining relationships between self-harm and SUD indicates that injurious behaviors appear to both precede, as well as begin or worsen with abuse of certain substances, such as psychostimulants (Muehlmann & Devine, 2008). The underlying mechanism associated with the complex interactions between deliberate self-harm and SUD appears to be emotional and behavioral dysregulation (Gratz & Tull, 2009). Moreover, deliberate self-harm behaviors and comorbid mood disorders (i.e., anxiety and depression) appear to be a particularly significant issue in women with childhood sexual abuse histories (Gladstone et al., 2004). Mood disturbances appear to have similar interactions with SUD, in that mental health disorders can lead to greater risk of substance abuse, or conversely, substance abuse can trigger or worsen psychiatric symptoms (Brady & Lyniard, 1992; Center for Substance Abuse Treatment, 2005; Quello, Brady, & Sonne, 2005; Schuckit, 2006). Overall, the presently discussed risk factors play complex, interactive roles in the progression of emotional and behavioral problems and associated substance abuse/dependence. Therefore, relationships between self-reports on assessments of respective SUD risk factors (e.g., depression and anxiety,

childhood trauma, ADHD, and deliberate self-harm) and the proposed CUSAPOS subscales will be used to examine convergent and divergent associations in order to clarify construct validity. Pearson correlations that indicate positive relationships (i.e., convergence) between self-reports on SUD risk factors and the CUSAPOS subscales will support the assumption that CUSAPOS items are accurately describing alcohol and drug abuse problems, respectively.

Analytic Plan and Hypotheses

Exploration of Substance Abuse Problems Across Age Cohorts.

The initial sample ($N = 1620$) of outpatient psychiatric patients that completed SCID interviews as part of the MIDAS project, were compared based on self-reported past-year substance abuse problems. After testing statistical assumptions, analyses described substance abuse patterns amongst the different age cohorts. Respective substance abuse severity ratings from the SCID interviews were dichotomized in order to differentiate between lifetime (i.e., ratings of one or two coded as 0) and past-year (i.e., ratings of three and greater coded as 1) substance abuse/dependence. Chi-square (χ^2) tests will be used to compare the prevalence of past-year substance abuse/dependence of respective drug types (i.e., sedative-hypnotic-anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens), between different age groups.

Principal Components Analyses and Confirmatory Measurement Development of the CUSAPOS Subscales

A subsample of 727 participants who reported past year substance abuse, were randomly split into two separate groups in order to be used in principal components analysis (PCA) ($N = 150$) and confirmatory factor analysis (CFA) ($N = 577$) for measurement development of the CUSAPOS subscales. The final factor structure was established based on fit indices including the comparative fit index (CFI), Tucker Lewis Index, the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA).

A subsample of 624 participants who endorsed at least one substance abuse problem on either CUSAPOS subscale were included in multigroup comparisons

examining variables that may confound the relationships between age and alcohol problems, or age and drug problems. ANOVAs assessing mean differences between the four Age Cohorts and each of the two CUSAPOS subscales were run before proceeding to examining other group differences, based on participant self-report on other measures that assess for potential SUD risk factors, as well as demographic characteristics. The Age Cohort groups have unequal sample sizes, therefore, the Dunnett C test was used for follow-up analyses on significant relationships between Age Cohorts and the CUSAPOS subscales.

To compare alcohol and drug abuse problems amongst different age groups, a series of analyses of covariance (ANCOVAs) were run with covariates, including the summed total scores of the self-report scales assessing for ADHD (ASRS), Childhood Trauma (CTQ), and Self-Injury (SIQ), which may influence the relationships between the categorical independent variable, Age Cohort, and continuous DVs, the proposed CUSAPOS measure. Two-way ANOVAs were conducted to examine the potential effect that confounding variables, including Race, Gender, and Mood Impairment may have on the mean differences in scores on each respective scale between Age Cohorts.

Hypothesis I

It is predicted that the descriptive crosstabulations will show significant group Chi-square differences in the types of drugs participants reported abusing in the past year ($N=1,620$) between Age Cohorts. Based on previous literature, it is expected that older age groups (i.e., Middle Age and Older Adults) will struggle with substances that may partially reflect problems with prescription drug abuse, such as sedatives/hypnotics/anxiolytics and opioids.

Hypothesis II

The internal consistency of items is expected to be adequate in both of the CUSAPOS subscales. A series of PCAs will detect any items that appear redundant and should therefore be eliminated from the measure. The two respective CUSAPOS subscale scores will be significantly correlated with scores on the measures that assess SUD risk factors, including those that assess for Childhood Trauma (CTQ), Self-Injury (SIQ), and ADHD symptoms (ASRS). Examination of factor structure is expected to show evidence for two distinct subscales that assess for alcohol and drug abuse problems, respectively.

Hypothesis III

It is expected that mean scores on the respective CUSAPOS subscales will vary significantly between age groups, specifically between younger and older age cohorts (i.e., Young Adult and Adult groups compared to Middle Age and Older Adults groups), due to generational differences. In addition, given that previous research indicates that factors such as race, gender, mental health problems, childhood trauma, ADHD, and Self-Injury may influence the severity of SUD problems across age groups, it is expected that the present study's ANCOVAs and two-way ANOVAs will reveal the influence that confounding variables including Race, Gender, Mood Impairment, ADHD, Childhood Trauma, and Self-Injury, may have on the mean differences in the respective CUSAPOS subscale scores, between Age Cohorts. However, as discussed above, the anticipated nature of these findings is unclear.

Methods

Participants and Procedures

The present study utilized cross-sectional data from an ongoing study, Methods to Improve Diagnostic Assessment and Services (MIDAS) at Rhode Island Hospital (PI: Mark Zimmerman, MD). Data were gathered from psychiatric outpatients seeking treatment at the Outpatient Psychiatry Practice of Rhode Island Hospital (RIH) (Dalrymple et al., 2013). Participants were excluded from the MIDAS study if they had difficulties communicating in the English language or had a history of developmental disabilities (Zimmerman et al., 2014). Of note, all participants were insured (i.e., not on Medicaid) and mental health treatment seeking. Participants underwent a clinician-administered Structured Clinical Interview for DSM Disorders (SCID), which provides supplemental details of participants' presentation of symptoms (Zimmerman, Morgan, Dalrymple, Young, and Chelminski, 2014). Trained SCID diagnostic interviewers rated patients' SUD severity upon intake, with single-item severity ratings ranging from 1 (least severe) to 8 (most severe) for respective drug classes including sedative-hypnotic-anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens. Participants ($N = 1,620$) who reported abusing substances at some point in their lifetime were included in the sample used to evaluate the prevalence of SUD by different age groups. For the purpose of these exploratory analyses, participant ratings were dichotomized to differentiate between lifetime and past-year substance abuse/dependence. Data assessing mood disorders and the severity of mood impairment were also derived from participants' responses on the SCID.

In addition to these interviews, participants were also asked to complete a self-administered questionnaire packet that includes measures assessing for the SUD risk

factors discussed above as well as the CUSAPOS subscales. Of the MIDAS study participants who completed the CUSAPOS items, only 727 participants that reported any alcohol or drug problems are included in the PCAs ($N = 150$) and CFAs ($N = 577$) of the CUAPOS and the CUDPOS. Demographics were assessed with single item measures. The demographic items of interest for the present analyses include age (i.e., age groups of 18-25, 26-35, 36-49, 50 and older), gender (i.e., female or male), and race/ethnicity (i.e., White, Black, Hispanic, Asian, Portuguese, Other, Native Hawaiian/ Other Pacific Islander, American Indian/Alaskan Native). The participants' ages range from 18 to 84-years-old. Approximately 25% are aged 18 to 25, 20% are aged 26 to 34, 33% are aged 35 to 49, 22% are aged 50 and older. The prevalence of females (53%) in this sample is similar to males (47%). In terms of race/ethnicity, the majority of the sample is White (88%), with Black being the second most prevalent racial group (4.8%). A small portion of the sample reported Hispanic (2.3%), Asian (1.4%), or Portuguese (2.2%) races/ethnicities.

Data from the age variable were recoded using SPSS version 26 software (IBM Corp, 2019), and grouped into four distinct age categories: Young Adult (coded as 0), Adult (coded as 1), Middle Age (coded as 2), and Old Adult (coded as 3). The Race variable was also recoded due to an inadequate sample size ($N < 50$) for the present analyses in the Black ($N = 33$), Hispanic ($N = 14$), Asian ($N = 10$), Portuguese ($N = 14$), and Other ($N=5$) racial groups, with no participants endorsing the Native Hawaiian/ Other Pacific Islander, or American Indian/Alaskan Native categories. These race groups were recategorized into two groups labeled as 'Persons of Color' ($N=76$) and 'White' ($N = 548$).

Measures

Substance Abuse Problems and Severity Measures

Clinically Useful Substance Abuse Problems Outcomes Scales (CUSAPOS)

The proposed screening tool, CUSAPOS, was derived mainly from the DSM-IV and two 15-item potential subscales were developed to better understand the severity of problems associated with alcohol and drug abuse, respectively. Of note, these two item sets cannot be considered as respective alcohol and drug abuse subscales until analyses for measurement development, as described below, confirm the validity and factor structure of the total 15 items in each scale. The items are self-administered and the instructions prompt participants to reflect on substance abuse problems experienced within the past two weeks. Items are rated on a 5-point Likert scale, ranging from 0 ('Not at all true') to 4 ('Almost always true'). Higher ratings, which are derived from the total score for each subscale, indicate more problems with abuse of alcohol and drugs, respectively.

Substance Abuse Severity Ratings

The Structured Clinical Interview for DSM-IV Disorders (SCID) is an extensive diagnostic tool that has shown reliability and validity across many different groups (First, Spitzer, Gibbon, & Williams, 2012). The severity of substance abuse behaviors across respective classes of drugs including sedative-hypnotic-anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens is measured with one-item ratings within the SCID. These items were clinician-administered, and participants were asked to clarify the specific substance(s) they struggle with and rate their self-perceived severity of abuse of respective substances on an 8-point Likert scale, with higher ratings indicating greater severity. Given that one-year of sobriety has consistently been shown to be one of the

most clinically significant indicators for life-long sobriety, significantly improved cognitive functioning, and improved overall satisfaction with life (Hagan et al., 2017), ratings were dichotomized to differentiate participants between two groups: lifetime substance abuse/dependence, and past-year substance abuse/dependence.

SUD Risk Factor Assessments

Mood Impairment

The Mood Disorders and Anxiety Disorders subscales of the Structured Clinical Interview for DSM Disorders (SCID) were used to assess for depression and anxiety symptoms. Trained interviewers rated each symptom based on patient responses on a 3-point scale with 1 indicating ‘absent or false’, 2 indicating ‘subthreshold’, and 3 indicating ‘threshold or true.’ Some sections include additional ratings: 4 which indicates the symptom ‘may be better accounted for by a general medical condition (GMC),’ 5 indicates the symptom is ‘definitely better accounted for by a GMC,’ and 6 indicates ‘baseline.’ SCID raters indicated that the patient reported inadequate information for appropriate rating of an item with ‘?’. Although the SCID that was utilized in this study is based on DSM-IV classification of disorders, interpretations were modified for the present study in order to reflect any DSM-5 revisions (Zimmerman et al., 2014).

Interviewers used the SCID to assess whether participants meet criteria for several different mood disorders, and they also assessed the level of mood impairment with scores summed into a categorical variable that indicates whether the participant meets criteria for severe mood impairment (coded as 1) or do not meet criteria for severe mood impairment (coded as 0). The present study is interested in examining the cognitive and behavioral problems or negative consequences attributed to substance abuse, therefore,

instead of using the variable that indicates whether participants meet criteria for a given DSM-IV disorder, the Mood Impairment variable was evaluated as a categorical independent variable (IV) in the present study.

Adult ADHD Self-Report Scale (ASRS), Symptom Checklist

The ASRS, Symptom Checklist (Kessler et al., 2005), is a self-report measure that includes 18 items describing problems caused by inattentive and hyperactive symptoms associated with ADHD (e.g., “How often do you interrupt others when they are busy?”). Participants reported the severity of these problems, within the past six months, by endorsing ratings ranging from ‘Never’ to ‘Very Often.’ A sum of the total item responses was used to indicate the severity of interfering symptoms caused by ADHD. Psychometric evaluation of this measure revealed it is useful in assessing for ADHD in SUD populations (Daigre et al., 2009). Participants’ summed scores on the ASRS were used to examine the effect ADHD symptoms may have on the relationships between age and alcohol or drug abuse problems. Appendix A shows the full list of ASRS items and ratings.

Childhood Trauma Questionnaire (CTQ)

The CTQ is a self-report measure that includes 53 items that inquire about sexual and physical abuse and neglect, family relationships/emotional support, and parenting behaviors (Bernstein, Fink, Handelsman, & Foote, 1994). Items reflect scenarios that describe both abusive and healthy family relationships, and the items that reflect protective factors were reverse scored (e.g., “There was someone in my family whom I admired and wanted to be like”). Participants are asked to rate each item on a 5-point Likert scale with 1 representing ‘Never true’ to 5 representing ‘Very often true.’ Higher

summed scores indicate greater severity of childhood trauma (Gaudiano & Zimmerman, 2010). Participants' summed scores on the CTQ were used to examine the effect a history of childhood trauma may have on the relationships between age and alcohol or drug abuse problems. Appendix B shows the complete list of CTQ items and ratings.

Self-Injury Questionnaire (SIQ)

The SIQ is a 13-item, self-report measure, that assesses whether an individual had deliberately injured him/herself by cutting, burning, picking, hitting, or scratching themselves in the past three months. Items were derived from the Inventory of Statements About Self-Injury (ISAS), which assesses for 13 functions of non-suicidal self-injury (Klonsky & Glenn, 2009). Participants reported how often they engaged in these behaviors, within the past three months, on a 4-point scale, from 0 'Never,' to 3 'Three or more times.' Higher scores indicate greater severity of deliberate self-harm behaviors. Total scores showing more severe deliberate self-harm behaviors typically indicate higher risk for other forms of behavioral dysregulation as well as suicidal thoughts and behaviors (Santa Mina et al., 2006). Appendix C shows the complete list of SIQ items and ratings.

Results

Substance Abuse Across Age Groups

In order to describe the rates of abuse and dependence of different classes of drugs (i.e., sedatives/hypnotics/anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens) amongst different age cohorts (i.e., 18-25, 26-35, 36-49 and 50+ years-old), crosstabulations were conducted on a sample of participants who endorsed having abused substances at some point in their lifetime ($N = 1,620$). Substance abuse and dependence severity ratings, ranging from 1 (least severe) to 8 (most severe) were assessed by an interviewer who was trained in administration and scoring of the Structured Clinical Interview for DSM IV Disorders (SCID). For the purpose of the present analyses, ratings were dichotomized to differentiate between lifetime ($N = 893$) and past-year substance abuse/dependence ($N = 727$).

Chi-square tests for independence were used to examine age group differences in drugs abused in the past year. Results revealed significant associations between age and sedative/hypnotics/anxiolytics, $\chi^2(3, N = 1620) = 19.85, p < .001$, cannabis, $\chi^2(3, N = 1620) = 23.85, p < .001$, stimulants, $\chi^2(3, N = 1620) = 36.03, p < .001$; and cocaine use in the past year, $\chi^2(3, N = 1620) = 32.37, p < .001$. No significant age differences were found in opioid abuse and dependence, $\chi^2(3, N = 1620) = 1.26, p = .74$, and hallucinogens, $\chi^2(3, N = 1620) = 3.22, p = .36$, and follow-up analyses revealed similar severity ratings across Age Cohorts. Cannabis abuse was the most prevalent across all the age groups (Young Adult = 21.2%, Adult = 23.5%, Middle Age = 30.5%, and Old Adults = 13.5, compared to all other substances included in the analyses. Overall, the 36-49 years-old cohort reported greater past-year abuse of sedatives/hypnotics/anxiolytics

(6.5%), cannabis (30.4%), stimulants (7.3%), opioids (6.1%) and cocaine (13.1%) compared to the other age groups. Table 1 presents detailed information on the rates of past year abuse of different drug types, within four age groups (i.e., ages 18 to 25, ages 26 to 35, ages 36 to 49, and ages 50 and older).

Principal Components Analyses Results

To examine the factor structure of the proposed CUSAPOS measure, the 30 item responses were factor analyzed using PCA with promax (oblique) rotation, using SPSS software version 26 (IBM corp., 2019) on a subsample that was extracted from the total 727 participants ($N = 150$). Table 2 shows demographic information, including gender and race, by Age Cohort, from the 727 participants included in the measurement development analyses. Table 3 shows the demographic information for the subsample used for the PCAs, exploring the factor structure of the initial proposed 30 items.

It was hypothesized that the 30-item response set in the proposed CUSAPOS would show a two-factor structure for alcohol and drug problems, respectively; however, PCA results showed that less than half of the variance that can be explained by a two-factor structure for alcohol (35.92%) or drug problems (23.57%). In addition, results from PCAs exploring the initial factor structure of the complete set of 30 proposed items revealed that items loaded onto two distinct factors, with the first 15-item set appearing to assessing for alcohol problems, and the latter 15 for drug problems. Table 4 shows the 30 items and their factor loadings from the exploratory PCA results. The KMO result assessing the overall fit of the total 30 items (.882) shows slightly weaker fit than the respective Clinically Useful Alcohol Problems Scale (CUAPOS) (.991) and the Clinically Useful Drug Problems Scale (CUDPOS) (.898), with the Barlette's Test of Sphericity

showing a significant chi-square test result, which indicates good overall fit for each scale (Krishnan, 2010). Overall, these results suggest that the items should be separated into two respective scales, separately assessing for alcohol and drug problems. To better understand the factor structure of each scale, two separate PCAs with a Promax (oblique) rotation, and two fixed factors, were conducted with the item response sets from each respective scale.

CUAPOS Development

The initial PCA results for the 15 items assessing for alcohol abuse problems show a two-factor structure with Factor 1 explaining 51.91% of the total variance. Upon further examination of the items in the CUAPOS, it appears that the items loading on Factor 1 assess for self-awareness or insight regarding alcohol problems (e.g., I thought that my drinking was a problem), whereas items loading on Factor 2 assess for alcohol abuse behaviors (e.g., I had more than 3 drinks of alcohol in a day). A correlation matrix was used to identify items that highly correlate (i.e., redundant items) in each respective scale. Items that highly correlated with multiple items were deleted. In addition to identifying correlated items for item reduction, weaker loadings (i.e., $\geq .40$) and cross-loadings were used as an indicator to extract additional items, including item 71 (i.e., “I couldn’t stop drinking when I wanted to”). After several iterations of item response sets were analyzed, PCA results showed that the best fit for the CUAPOS is a two-factor model with a total of nine items. After identifying the factor structure of this scale, the goodness of fit of this model was then confirmed with a CFA on the overall sample.

CUDPOS Development

The 15 items assessing for drug abuse problems were also factor analyzed using PCA with a Promax (oblique) rotation. Consistent with the CUAPOS factor structure, Factor 1 in the CUDPOS appears to describe insight on one's own drug abuse problems and it explains 65.79% of the total variance, whereas Factor 2 appears to assess for the behavioral problems associated with drug abuse and dependence. Highly correlated items, and items with low factor loadings or cross-loadings, were evaluated for the extraction of complicated items such as item 87 (i.e., "I had a strong urge to use drugs") in the CUDPOS scale. The PCA results exploring different iterations of item response sets, indicated that the best fit for the CUDPOS is a two-factor model with a total of eight items. This factor structure was confirmed with CFAs examining the overall model fit, as discussed below. Table 5 shows the mean (*M*) and standard deviation (*SD*), as well as the factor loading for each item included in the confirmed factor structure for both the CUAPOS and the CUDPOS.

Confirmatory Factor Analysis Results

The statistics program, R, was used to perform CFAs on the remaining 577 participants, to evaluate the goodness of fit of each model (i.e., the CUAPOS and the CUDPOS) across four different age cohorts: Young Adults ($N = 152$), Adults ($N = 132$), Middle Age ($N = 201$), and Old Adults ($N = 139$). Before running CFAs on the CUAPOS and the CUDAPS, respectively, exploratory analyses confirmed that statistical assumptions such as normality, linearity, and homoscedasticity were met for the distribution of scores across age cohorts, for both scales. In addition, the large size of the total sample ($N = 577$) is adequate to properly establish model fit (Fischer & Karl, 2019).

Chi-square tests are not a reliable indicator for the present analyses, given that the large sample size creates a significant chi-square result, artificially rejecting the model (Fischer & Karl, 2019). Therefore, each two-factor model was evaluated for goodness of fit based on four alternative fit indices including the CFI, TLI, SRMR, and the RMSEA (Cook, Kallen, & Amtmann, 2009; Xia & Yang, 2018). A CFI and TLI value of .95 or higher indicates good model fit, and in contrast, lower values (ideally between .06 to .08) for the lack of fit indices, RMSEA and SRMR, indicate better model fit (Fischer & Karl, 2019). The two-factor solution for the CUAPOS showed good model fit across indices (CFI = .997, TLI = .995, SRMR = .046, RMSEA = .064), as well as the CUDPOS (CFI = 0.972, TLI = .958, SRMR = 0.031, RMSEA = 0.081). Both the CUAPOS and CUDPOS showed good fit for each respective age cohort. Table 6 shows detailed information on the goodness of fit indices by age cohort, for both the CUAPOS and the CUDPOS.

Multigroup Confirmatory Factor Analyses for the CUAPOS

To examine whether the CUAPOS has the same measurement properties across the four age cohorts (i.e., Young Adults, Adults, Middle Age, and Old Adults) multi-group CFA was the statistical method employed. In a hierarchical fashion, CFAs were performed with different levels of parameter constraints, in order to test the level of invariance across age cohorts (Fischer & Karl, 2019) For the first step, a CFA analyzed form invariance, or configural invariance to examine the overall fit, with the theoretical assumption that the items were loaded on the same latent factor with no parameter constraints, in the CUAPOS. The fit indices for the configural invariance of the CUAPOS show results that are below the typical cut-off levels for good model fit across all indices (CFI = .914, TLI = .898, SRMR = .054, RMSEA = .128), however, these results show

adequate model fit when the large total sample size ($N = 577$) is considered (e.g., $CFI \geq .901$, Shi et al. 2019). The second level to invariance testing is factorial, or metric invariance, which constrains factor loadings to be equal across age groups. This test reveals any non-uniform item bias amongst the different age cohorts (Fischer & Karl, 2019). Compared to the configural invariance results, metric invariance results show poorer model fit across indices ($CFI = .898$, $TLI = .883$, $SRMR = .088$, $RMSEA = .127$). Given the relatively poor fit of the model at the metric invariance level, invariance testing did not proceed to comparisons of models with more parameter constraints. An Analysis of Variance (ANOVA) compared the chi-square test statistics between the first, configural model, and the second, factorial model: $\chi^2(21) 66.86, p = .001$. A significant chi-square difference test result ($p \geq .05$) would indicate that responses on the CUAPOS are theoretically equivalent across age groups, meaning that the scale items assess for the same latent constructs, in a similar manner across age cohorts (Fischer & Karl, 2019). Therefore, the significant chi-square difference test result between the two models (i.e., configural invariance and metric invariance) for the CUAPOS, indicates that the model does not show adequate invariance to assume that the scale items equivalently assess for the same latent factors, in a similar manner across the four age cohorts.

Multigroup Confirmatory Factor Analysis for the CUDAPS

A series of CFAs were performed to assess the level of invariance with different parameter constraints. With no parameter constraints, the CFI and the SRMR indicate adequate goodness of fit for the configural invariance model (CFI = .913, TLI = .872, SRMR = .05, RMSEA = .153). As previously mentioned, the lower than desired TLI statistic as well the higher than desired RMSEA, may be influenced by the large total sample size (Shi et al., 2019). The second step, a CFA constraining the factor loadings to be equal for metric invariance testing, showed adequate fit across all indices (CFI = .90, TLI = .881, SRMR = .094, RMSEA = .148). Therefore, like the CUAPOS, invariance testing did not continue to show good model fit with added constraints (i.e., scalar invariance, and strict invariance). An ANOVA compared the CFA results between the first (configural invariance) and second (metric invariance) models and showed a significant chi-square difference test result. This indicates that the CUDPOS is non-invariant amongst age cohorts, and it cannot be assumed that the items reflect the same latent factors similarly across age groups. Table 7 shows results from the invariance testing on both the CUAPOS and the CUDPOS.

Descriptive Statistics for Demographic Characteristics and SUD Risk Factors

In order to reduce skew in participants' responses to items on the CUAPOS and the CUDPOS, the cases that did not endorse any substance abuse problems (i.e., participants who reported a total score of zero on both scales) were eliminated. Only the participants who endorsed at least one substance abuse problem on either the CUAPOS or the CUDPOS were included in the analysis of variables that may confound the mean differences in participant scores on each respective scale, between age groups ($N = 624$).

Correlations were used to describe the linear relationships between the scales used in the present study, which include the CUAPOS ($N = 624$, $M = 6.63$, $SD = 7.40$), the CUDPOS ($N = 624$, $M = 3.2404$, $SD = 6.15$), the ASRS ($N = 326$, $M = 35.39$, $SD = 12.67$) the SIQ ($N = 515$, $M = 2.04$, $SD = 3.56$) and the CTQ ($N = 544$, $M = 106.78$, $SD = 45.88$), on the subsample of participants who endorsed at least one substance abuse problem on either the CUAPOS and the CUDPOS. Table 8 shows the descriptive statistics for each scale and the correlations of mean scores between the scales across the four age groups (Young Adults, Adults, Middle Age, and Older Adults). A weak, yet statistically significant positive correlation was found between the CUDPOS and the SIQ ($r(515) = .09$, $p < .05$), meaning that as self-reported problems related to drug abuse problems increase, self-injurious behaviors may be likely to increase as well. The ASRS showed a significant positive correlation with the CUDPOS ($r(326) = .15$, $p < .01$), meaning that as participants reported more ADHD symptoms, they also reported more drug abuse problems. The CUDPOS also showed a weak, but significant inverse relationship with the CTQ ($r(515) = -.09$, $p < .05$), which indicates that as participants reported less childhood trauma, they also reported less drug abuse. The SIQ also showed a positive correlation to the ASRS ($r(326) = .26$, $p < .01$), indicating that higher levels of ADHD symptoms may be related to more severe levels of self-injury. Of note, the CUAPOS and the CUDPOS were orthogonal, with a correlation close to a zero ($r(624) = .02$, $p > .05$). This result is consistent with the PCA results previously described, which suggest that the proposed CUSAPOS measure should be treated as two conceptually distinct scales. Table 7 shows the correlations between the scales included in the present study.

Demographic Characteristics on Participants Who Self-Reported Substance Abuse Problems in the Past Week

To describe the categorical groups examined in the present analyses, crosstabulations compared gender, race, and mood impairment by Age Cohort, in a subsample of participants who reported experiencing at least one substance abuse problem in the past week. Results show that percentages for female (51.6%) and for men (48.4%) were similar to the larger sample of 727 of participants who reported having abused a substance in the past year; however, the larger sample shows more of a percentage difference between females (53.0%) and males (47.0%). Similar to the larger sample of 727, the smaller sample of past week substance abusers have a similar percentage of White participants (87.8%), with only 4.8 percent representing Persons of Color. Table 9 shows a detailed description of this subsample's demographic characteristics, as well as the significant mood impairment, by Age Cohort.

After the best fitting models for both the CUAPOS and the CUDPOS were found using CFAs ($N = 577$), the sample used for CFAs was merged with the sample used for the initial PCAs ($N = 150$), to return to the total number of participants in the present study ($N = 727$). A subsample that includes the data from the CUAPOS and the CUDPOS together with data derived from continuous and dichotomous measures that assess several substance abuse risk factors as well as demographic characteristics including: Gender (i.e., Female or Male), Race (i.e., White or Person of Color), the Adult ADHD Self-report Scale, Symptom Checklist (ASRS), the Self-Injury Questionnaire (SIQ), the Childhood Trauma Questionnaire (CTQ), and Mood Impairment (i.e., rated as 'yes' or 'no' using SCID criteria for impairment and distress). Ratings from these measures will be used to examine the potential moderating effects these risk factors may have on the relationships

between participants' age and their responses on the CUAPOS and the CUDPOS, respectively. As previously described, of the total 727 participants, those who denied all the items on the two respective scales (i.e., cases who reported a total score of zero on both the CUAPOS and CUDPOS) were eliminated from the dataset, resulting in a sample size of ($N = 624$). Although deleting cases with zero totals on the two combined scales addressed some of the non-normality of the distribution of scale scores, follow up exploratory analyses revealed that the data was highly skewed, with several outliers in each respective scale. Log transformation was used in SPSS version 26 (IBM corp., 2019), which corrects normality of the distribution of scores across Age Cohorts. Exploratory analyses confirmed the statistical assumptions for Analysis of Variance (ANOVA), including normality and homogeneity of variance, were met before the two-way (ANOVA) and Analysis of Covariance (ANCOVA) were used to examine possible relationships between SUD risk factors and relationships between age cohort and scores on each respective scale.

Comparisons of Age Cohort Differences on the CUAPOS

A one-way ANOVA comparing mean differences of participant scores on the CUAPOS between the four different Age Cohorts (i.e., Young Adults, Adults, Middle-age, and Old Adults) showed nonsignificant results ($F(3, 620) = .368, p = .776$). This indicates that there are no significant age group differences in participants' responses to the CUAPOS items. Although results indicated no main effect between the independent variable (IV), Age Cohort, and the dependent variable (DV), participant responses on the CUAPOS, a series of two-way ANOVAs were conducted to evaluate the relationship between Age Cohort (IV) and the participant scores on the CUAPOS, controlling for

demographics and risk factors for substance abuse problems including, Race (White or Persons of Color), Gender (Female or Male), ADHD (total score on the Adult ADHD Self Report scale *Symptom Checklist*), Mood Impairment (Yes or No), Self-injury (total score on the SIQ), and Childhood Trauma (total score on the CTQ).

Although the initial ANOVA examining Age Cohort differences on mean scores on the CUAPOS was non-significant, follow up analyses controlling for confounding variables were conducted. Two-way ANOVA was the statistical method used to examine the mean changes in the relationship between Age Cohort and participant scores on the CUAPOS when categorical variables including Race, Gender and Mood Impairment were controlled for. Results showed nonsignificant interactions in mean differences on Alcohol Abuse Problems scores between Age Cohorts and Gender ($F(3, 616) = 1.284, p = .279$), as well as Age Cohorts and Mood Impairment ($F(3, 616) = .899, p = .441$).

An interaction between Age Cohort and Race and scores on the CUAPOS showed statistical significance ($F(3, 616) = 2.802, p = .039$). Participants in the Person of Color group who were in younger age cohorts (i.e., Young Adult and Adult), as well as the Old Adult group, reported significantly less alcohol abuse problems than compared to the Middle Age, Person of Color group. This group also scored significantly higher than the White groups across Age Cohorts. Conversely, participants in Young Adult, Persons of Color subgroup, reported significantly less alcohol abuse problems compared to all the Age Cohorts in the White, sample as well as the three older Age Cohorts in the Persons of Color group. Participants in the Age Cohorts, Adult and Old Adult, scored similarly on the CUAPOS across race groups. Figure 1 is a line graph illustrating the significant interaction effect between Age Cohorts and Race, on CUAPOS scores.

The two-way ANOVA results also showed non-significant main effects between the two IVs, Age Cohort ($F(3,616) = 2.551, p = .055$) and Race ($F(1,616) = .088, p = .766$) and the DV (i.e., scores on the CUAPOS). Separate, follow up ANOVAs examining the main effect of CUAPOS scores across the different Age Cohorts ($F(3, 620) = .368, p = .776$), as well as the main effect of CUAPOS scores across the Race groups ($F(1, 622) = .004, p = .947$), yielded non-significant results. This suggests that participants' CUAPOS scores do not significantly differ between the four different Age Cohorts. Therefore, the two IVs, Race and Age Cohort, show a significant interaction effect on Alcohol Abuse Problems (DV), a finding not evident when race and age cohort are not in the two-way ANOVA model together. It is important to note that this result may be difficult to accurately interpret due to unequal sample sizes in each group with the large majority being White ($N = 548$). In addition, this variable is limited in its ability to provide descriptive information on race, given that the sample sizes of individual race groups were too small for the present analyses.

A series of ANCOVAs showed nonsignificant results for the influence of participant responses on the SIQ ($F(3, 515) = .181, p = .909$), the ASRS ($F(3, 321) = .328, p = .805$), and the CTQ ($F(3, 539) = .357, p = .784$).

Comparisons of Age Cohort Differences on the CUDPOS

A one-way ANOVA comparing mean differences of participant responses on the scale between the four different age cohorts (i.e., Young Adults, Adults, Middle-age, and Old Adults) showed significant group differences ($F(3, 620) = 3.728, p = .011$). A follow up Dunnett C test identified significant mean differences in responses to the CUDPOS between the Young group and both the Middle-age ($M = .307, SD = .115, p = .037$) and

the Old Adult ($M = .377$, $SD = .122$, $p = .014$) groups. Table 10 describes results from ANOVAs assessing mean differences in scores on both the CUAPOS and the CUDPOS, by Age Cohort.

A series of two-way ANOVAs were conducted to examine the influence categorical IVs including Race (White or Persons of Color), Gender (Female or Male), Mood Impairment (Yes or No) the mean differences in CUDPOS scores between Age Cohorts. Results showed nonsignificant interactions in mean differences on CUDPOS scores between Age Cohort and Gender ($F(3, 616) = 2.489$, $p = .059$), Age Cohort and Race ($F(3, 616) = .899$, $p = .441$) and Age Cohort and Mood Impairment ($F(3, 616) = .349$, $p = .790$). However, a significant main effect was found for the mean differences between Female and Male responses on the CUDPOS ($F(1, 616) = 7.526$, $p = .006$). A follow up one-way ANOVA was conducted to further assess the significant main effect between Gender and participants' scores on the CUDPOS ($F(1, 622) = 5.446$, $p = .020$). These findings indicate that Age Cohort and Gender separately show main effects on responses on the CUDPOS; however, when the interaction between Age and Gender is considered in relation to mean differences in scores on the CUDPOS, the interaction effect between the two IVs and the DV loses statistical significance ($p = .059$). Table 11 shows detailed results from the two-way ANOVA analyzing the mean differences in CUDPOS scores across Gender and Age Cohort groups.

A series of ANCOVAs were conducted to compare mean group differences in participant responses on the CUDPOS between Age Cohorts, while controlling for covariates including Self-injury (total score on the SIQ), ADHD (total score on the ASRS), and Childhood Trauma (total score on the CTQ). The influence of SIQ scores on

the mean difference between CUDPOS scores by Age Cohort, was found to be non-significant ($F(3, 510) = 1.815, p = .143$); however, the SIQ was found to be significantly related to the CUDPOS ($F(1, 510) = 5.793, p = .016$). Results also showed that ADHD was not found to significantly influence the mean differences between Age Cohort group scores on the CUDPOS ($F(3, 321) = .748, p = .524$). Overall, results show that Childhood Trauma was the only significant covariate, moderating the mean differences in CUDPOS scores between Age Cohort groups ($F(3, 539) = 2.848, p = .037$). Further, the CTQ and CUDPOS participant responses do not significantly relate to each other ($F(1, 539) = 1.183, p = .277$). These results show that Childhood Trauma does not directly influence the DV, the CUDPOS, but it is a significant covariate that impacts the mean differences between Age Cohorts and responses on the CUDPOS. Table 12 shows detailed results for the significant influence childhood trauma appears to have on the mean differences in CUDPOS scores between Age Cohorts.

Discussion

The first goal of this study was to evaluate the psychometric properties of a proposed scale to provide a clinically useful index of substance problems with differentiation between alcohol and other substances. It was hypothesized that generational differences in alcohol and substance problems would be found and that these generational differences would be influenced by other factors such as presence of depression, anxiety, or ADHD history. The generational effects were assessed by examining group comparisons in self-reported substance abuse and dependence problems, across four different age groups, including Young Adult, Adult, Middle Age, and Older Adult. As part of the MIDAS study at Rhode Island Hospital, participants reported whether they experienced past year substance abuse in a SCID interview and SUD problems were assessed by participants' responses on two distinct scales in the Clinically Useful Substance Abuse Problems Outcomes Scale, the CUAPOS and the CUDPOS. The total sample ($N = 1,620$) represents psychiatric outpatients who disclosed past-year substance abuse history in a SCID interview as part of the MIDAS study. Of the larger sample of 1,620, 727 reporting past-year substance abuse and dependence, and 624 reporting at least one alcohol or drug related problem in the past week.

For the first study goal a series of exploratory, confirmatory, and metric invariance analyses were used to examine the factor structure of the proposed CUSAPPOS measure. This graded set of analyses found that the items of the CUSAPPOS were not best characterized as one scale with two factors that assess substance and alcohol use. Instead, measure development analyses suggested that the 15 items each assessing alcohol or drug use be treated as separate scales entirely. Exploratory factor analysis

conducted separately on each of the 15-item drug and alcohol item sets supported a two-factor structure for each independent scale (name the two factors). Confirmatory analyses supported the two-factor structure of each new scale; the Clinical Useful Alcohol Problems Outcomes Scale (CUAPOS) and the Clinically Useful Drug Problems Outcomes Scale (CUDPOS). However, these new scales were not found to be invariant by age grouping suggesting that the interpretation of the items for each scale varied from one age group to another. Multigroup CFAs confirmed good model fit across Age Cohorts for both the CUAPOS and the CUDPOS. Two-way ANOVAs and ANCOVAs were used to examine the influence confounding variables that represent demographic characteristics (i.e., Race, Gender), as well as SUD risk factors (i.e., Mood Impairment, ADHD, Childhood Trauma, and Self-Injury), which may influence the mean differences in participants responses to the respective CUSAPOS subscales, between the four Age Cohorts.

Analyses comparing drug abuse problems (i.e., drug categories: sedatives/hypnotics/anxiolytics, cannabis, stimulants, opioids, cocaine, and hallucinogens) across the four age cohorts (i.e., Young Adults, Adults, Middle Age, and Old Adults) revealed that cannabis was overwhelmingly the most common substance abused across age groups. This finding is consistent with national and global reports indicating that the perception of harm from cannabis use is decreasing overtime, and consequently, the rates of cannabis abuse continue to increase over the time. This appears to be a growing problem in all age groups. Descriptive results also showed that compared to other Age Cohorts, the Middle Age group showed the highest rates of substance abuse (i.e., across drug type categories). This finding is consistent with statistics from the 2015-

2016 National Survey on Drug Use and Health (NSDUH) showing a growing concern of increasing rates of SUD problems in middle age and old adult populations (Perlman, 2019). In fact, Han and Palamar (2018) examined trends of marijuana use in middle-aged and older Americans found that the percentage of respondents age 50 to 64 (9%) and the percentage of respondents age 65 and older (2.9%) reporting use of marijuana during the past year "...represented increases of 27 percent and 107 percent compared with the 2012–2013 NSDUH; and 100 percent and 625 percent compared with the 2006–2007 survey" (Perlman, 2019). Moreover, results from the 2015-2016 NSDUH also showed that rates of marijuana use were three times more prevalent in middle aged participants than in the older group (Han & Palamar, 2018; Perlman, 2019). The prevalence of marijuana use in the Middle Age cohort compared to the Old Age cohort in the present study, appears to be similar, but slightly less than the national averages reported in a similar time frame as the year the data were collected for the present study (the Middle Age cohort reported approximately 2.5 times more past-year marijuana use compared to the Old Age cohort). These findings represent a growing public health risks, especially given that additional analyses show strong associations between marijuana use later in life and higher likelihood to struggle with cocaine abuse, prescription opioid misuse, nicotine dependence and major depression (Perlman, 2019). Of note, older past-year marijuana users are at approximately 8 times greater odds of cocaine use than those who did not report using marijuana in the past year (Han & Palamar, 2018). Therefore, the high rate of past year cocaine abuse (13.1%), as well as stimulant abuse (7.3%), in the Middle Age cohort compared to all the other age groups, in the present study, may be representative of national trends.

National statistics suggest that the problem of the heroin and prescription opioid and benzodiazepine misuse may be growing exponentially in U.S. older populations. Huhn, Strain, Tompkins, and Dunn (2018) examined the rates of first-time treatment admissions for primary opioid use disorder in adults age 55 and older and they found that they almost doubled in this population since 2007, with the sharpest increase occurring between 2013 and 2015 (53.5%), with the large majority being heroin abusers. These rapid increases in the rates of opioid abuse disorder in older adults contrast the steady increase in younger populations, with approximately 10% more first-time treatment admissions per year since 2007 (Huhn et al., 2018).

Research findings also suggest a significant link between prescription opioid and benzodiazepine abuse and misuse in older populations. Schepis, Simoni-Wastila, and McCabe (2019) analyzed the 2015-2016 NSDUH data to examine the potential risks associated with prescription misuse in adults age 50 and older. They found that those participants who misused both prescription opioids and benzodiazepines, were 10 times more likely to have serious suicidal ideations than those who did not misuse these substances in the past year (Schepis et al., 2019). Unfortunately, little is understood about this special risk in older populations and more research is needed to better understand additional health risks associated with the co-administration and misuse of both benzodiazepines and opioids (Maree et al., 2016). The present study shows similar rates between opioid and sedative/hypnotic/anxiolytic past year abuse in the Middle Age Cohort, the age group that showed significantly higher rates of past year misuse of those substances in comparison to the age cohorts. Future research examining the health risks related to prescription opioid misuse, combined with benzodiazepine misuse, in the

present study's older groups may reveal meaningful insights for prescribing practitioners.

Principal components analyses (PCAs) exploring factor structure within each distinct scale (i.e., the CUAPOS and CUDPOS), revealed a similar two-factor structure for both scales. The two scales share conceptually similar two factor structures, with one factor's items appearing to assess cognitions associated with one's own substance use (i.e., one's self-awareness of their substance abuse problems), and the other assessing for behaviors associated with SUD. However, the PCA results as well as the orthogonal (i.e., near zero correlation) suggest that the two scales may be conceptually different.

A series of confirmatory factor analyses (CFAs) were performed in order to confirm the factor structure found in PCAs for each respective scale and find the best fitting model for each scale across age groups. This procedure was necessary in order to find the best model fit for both the CUAPOS and the CUDPOS across Age Cohorts. CFAs on the overall sample showed good fit for the two-factor structure in each respective scale, across age groups. Measurement invariance testing using multi-level CFAs showed non-invariance in both the CUAPOS and the drug abuse problem scale, suggesting that there are meaningful differences in how participants responded to each scale based on their age cohort. This result may reflect national trends showing key differences between youth and older adult substance abusers (NSDUH 2018).

A one-way ANOVA examining Age Cohort comparisons of mean scores on the CUAPOS showed nonsignificant differences across Age Cohorts on the CUAPOS. The only notable group differences found from conducting two-way ANOVAs and ANCOVAs, may be a significant interaction effect between Race and Age Cohort on

CUAPOS however no main effect was found between Race and participant scores on the CUAPOS. The interaction showed that Persons of Color in the Young Adult group scored significantly lower on the CUAPOS than the other Age Cohort groups, including the Adult, Middle Age, and Older Adult groups. Results from this analysis also shows that the Young Adult, Person of Color, group endorsed significantly less problems on the CUAPOS compared to White participants in the Young Adult group. Results appears to be consistent with national reports indicating that alcohol abuse in youth populations has continued trending down since 2015. Research also supports the present study's finding that young Persons of Color may be at less risk for severe alcohol use disorder compared to White youth. Several psychosocial factors may explain this difference in youth populations, including peer use, parental factors, and religiosity (Dickens , Jackman, Stanley, Swaim, & Chavez, 2018; Su et al., 2020). Dickens and colleagues (2018) compared the prevalence and effects of psychosocial risk factors for alcohol abuse problems between White and African American rural adolescents. They found that religiosity, peer use, and parental permissiveness were factors that were more strongly associated with increasing the risk of alcohol abuse in White youth compared to African American youth. Although racial discrimination has been shown to increase the risk of African American youth abusing alcohol and other substances, appropriate racial socialization by peers has been shown to be a significant protective factor from alcohol abuse problems in young Persons of Color (Su et al., 2020). In contrast, the Middle Age, Persons of Color group showed significantly higher reports of alcohol abuse problems than any other Age Cohort across both Race groups. Research examining differences in alcohol abuse problems and socioeconomic factors points to lacking education and poor

social support as risk factors that have a significantly greater impact on middle age or older adults in African American populations compared to Whites (Karriker-Jaffe, Witbrodt, & Mulia, 2019). One of the potential consequence of these low education attainment and poor social support, economic disadvantage, is one of the greatest risk factors for alcohol use disorder in Middle Age populations in African American communities (Assari, Smith, Mistry, Farokhnia, & Bazargan,, 2019). It is important to note that these results may be difficult to interpret due to unequal sample sizes in each group with the large majority being White ($N = 548$) and the Persons of Color group being much smaller ($N = 76$). In addition, this variable is limited in its ability to provide descriptive information on race and ethnicity, given that the sample sizes of individual race groups were too small ($N < 50$) to be examined as more descriptive race groups in the present analyses.

Group Comparisons for the CUDPOS

A one-way ANOVA examining mean differences in participants' responses to items on the CUDPOS between Age Cohorts, found significant differences between the Young Adult group and two other Age Cohorts: Middle Age and Old Adults. This finding is consistent with the results from the present study's chi-square tests, describing the prevalence of drug abuse problems within each Age Cohort. Moreover, results from both the initial ANOVA and crosstabulations (chi-square tests) comparing drug abuse problems showed results that are consistent with national and global trends. While both national and global SUD trends show a progressive decrease in abuse of alcohol and most illicit drugs, public health officials are concerned that certain drug abuse, especially cannabis abuse, is becoming more socially acceptable. This is of particular concern in

youth populations, given that national and global trends indicate that they (i.e., ages 12 to 25) are the age group most likely to perceive cannabis abuse as having low health risks, and therefore, they are at highest risk for engaging in cannabis abuse early in life, particularly before age 19 (NSDUH 2018; Lipari et al, 2017). There is evidence that suggests the trending increase in cannabis abuse also puts youth at risk for developing problems with cocaine abuse, nicotine dependence, major depression, and prescription opioid abuse later in life (Perlman, 2019).

A two-way ANOVA examining the interaction effect of age and gender on participants' reported drug abuse problems. Results showed a nonsignificant interaction effect between age and gender on drug abuse problems, similar to age, gender showed a main effect on drug abuse problems across Age Cohorts. Figure 1 shows significant differences and similarities comparing the two gender groups across the four different age groups (i.e., Young Adult, Adult, Middle Age, and Older Adult). The most dramatic differences in drug abuse problems between gender groups are shown in early adulthood (i.e., Young Adult and Adult age groups), with females reporting significantly less drug abuse problems than males, most notably in the Adult age group. In fact, the mean score on the CUDPOS in the male, Adult age group, was the highest compared to the other male age groups, whereas the female, Adult age group scored the lowest compared to the other female age groups, with the most dramatic decrease showing between the Young Adult and Adult female groups. Research suggests that the differences between male and female drug abuse behaviors are nuanced. A recent cross-sectional study, based on interview data from Swedish adolescents in outpatient clinics, found that females tend to have more severe substance abuse consequences, and risk factors, including more

difficult home environments than boys, and are more likely to have problems related to school, more serious substance abuse problems, and more severe mental health problems (Anderberg & Dahlberg, 2018). Anderberg and Dahlberg (2018) highlighted a “gender paradoxical relationship” in which females enter treatment for substance abuse problems at much lower rates than men; however, females who struggle with SUD tend to experience more life problems. Reports from the 2017 NSDUH data show that while much of the current research and public support for the opioid epidemic is aimed at women, there is a rapidly growing problem of opioid use disorder and prescription drug misuse among U.S. males (Silver & Hur, 2020).

An ANCOVA examining the moderating effect that childhood trauma may have on the mean differences in CUDPOS scores between age groups, revealed that childhood trauma is a significant covariate that influences the significant relationship between age and drug abuse problems. This finding is consistent with research showing that Adverse Childhood Events (ACEs), significantly predict life-time substance abuse problems, starting in adolescence and into older adulthood (Choi, DiNitto, Marti, & Choi, 2017). While ACEs similarly predict SUD outcomes across demographic groups, notable differences between gender and racial groups who are victims of childhood trauma who struggle with SUD throughout adulthood. Choi and colleagues (2017) examined data ($N = 14,738$ for the 50 and older age group), from the 2012 to 2013 National Epidemiologic Survey on Alcohol and Related Conditions. They found that boys who experience ACEs are more likely to develop antisocial behaviors early in young adulthood compared to girls who report similar ACEs, and White participants reported greater adverse mental health impact compared to Blacks and Hispanics with similar ACEs. A study examining the

relationship between childhood trauma and SUDs, found significant correlations between levels of childhood trauma, including physical, sexual, and emotional abuse, substance abuse (particularly cocaine abuse), and current PTSD symptoms (Khoury et al., 2010). In fact, the authors explained that while controlling for exposure to adult trauma, a significant additive effect of the number of different types of childhood trauma, combined with a history of cocaine dependence was found to be predictive of current PTSD symptoms (Khoury et al., 2010). Future research examining data from the MIDAS project may reveal additional insights regarding the relationship between childhood trauma and SUD.

Limitations

Given that substance abuse behaviors are typically under-reported, self-report measures may provide a limited view of the scope and severity of SUD within this sample (Tourangeau and Yan, 2007). This issue may be due to lack of insight regarding the severity of problems associated with SUD, fear of repercussions, or social desirability. Moreover, while the participants included in the two-way ANOVA and ANCOVAs examining demographic characteristics and SUD risk factors (i.e., race, sex, mood impairment, childhood trauma, self-injury, and ADHD) endorsed at least one substance abuse or dependence related problem in the past week (i.e., on the CUAPOS or the CUDPOS), many participants in the present sample did not respond to information on every measure used in the present analyses. For example, of the total sample that completed the self-report questionnaires ($N= 624$), approximately half of these participants completed the ASRS ($n= 326$). Therefore, interpretations of the results from the present analyses should consider the potential for under-reporting.

Another potential limitation of this sample is that participants were recruited from an outpatient mental health setting. This sample may represent a subsample of patients with SUD who are more willing to seek treatment and are currently experiencing less severity of symptoms than those in partial and inpatient mental health or residential rehabilitation programs. Moreover, the participants are privately insured, and research consistently shows a longstanding history of healthcare disparities between the insured and uninsured or underinsured U.S. patient populations (Angier et al., 2017). Overall, research suggests that uninsured patients are significantly less likely to seek healthcare services because of low quality of care, and limited availability of outpatient

appointments compared to insured patients. Given that poorer healthcare resources puts one at risk for mental health problems and SUD, it can be assumed that the results from the present study may vary between patient populations with different socioeconomic backgrounds. Therefore, the generalizability of these findings to the SUD population overall may be limited such that the present study's sample may represent a more privileged group of treatment seeking patients.

Lastly, a major limitation in the present study overall, is that the Chi-square difference tests on the two respective scales of interest (the CUAPOS and the CUDPOS) show non-invariance between Age Cohorts. This means that while the overall goodness of fit indices for the total sample ($N= 577$), as well as the goodness of fit indices within each Age Cohort showed good model fit, the manner in which participants in different age groups interpret and respond to items is different for each respective scale. Given that the nature of these age group differences in the present study's sample is unclear, interpretation of results from the ANCOVA and two-way ANOVAs following the multigroup CFAs, should be interpreted with caution.

Suggestions for Future Research

It is important to note that the measurement development portion of the present study does not include participants who denied past year drug abuse in their SCID interviews, potentially eliminating useful information from participants who identify as recovering addicts who have stayed sober past one year, and those who have no SUD history. Qualitative data from the non-substance abusers in the overall MIDAS project sample may provide useful insights on stigma and other sociocultural issues related to SUD problems. The role of the patient's primary care physician (e.g., medication management, SUD assessment, and SUD treatment) is another important area to explore in future research. Physician stigma against patients struggling with SUD has been shown to have a negative impact on patient empowerment and treatment outcomes (Van Boekel, Brouwers, Van Weeghel, & Garretsen, 2013). Therefore, in addition to better understanding how stigma in the general population may negatively impact SUD problems, the influence that physician biases about substance abuse may have on their patients' assessment and treatment outcomes, may be another important area to explore in future research.

Given that generalizability of the present study's sample may be limited, due to factors such as insurance status (i.e., sample is limited to privately insured patients) and substance abuse and dependence status (i.e., sample is limited to patients with past-year substance), and small group sizes in some of the study's variables (e.g., Race), replication of this study with a larger, more diverse sample of participants who report past-year substance abuse may provide different results. A larger, randomized sample would likely yield more statistical power and therefore provide more reliable results. In summary, new

measurement development efforts to improve the CUDPOS and CUAPOS scales are necessary to ensure invariance of the measures by age groups. This effort could also evaluate the invariance of the new scales by potentially important demographic groups such as gender or race. This research has the potential to provide two novel, and reliable screeners for alcohol and drug abuse problems that physicians can efficiently utilize in outpatient settings in order to improve the treatment outcomes of patients from diverse demographic groups.

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Appendix A

Adult ADHD Self-Report Scale

Instructions: Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the last 6 months.	Never	Rarely	Sometimes	Often	Very often
1. How often do you have trouble wrapping up the final details of a project once the challenging parts have been done?					
2. How often do you have difficulty getting things in order when you have to do a task that requires organization?					
3. How often do you have problems remembering appointments or obligations?					
4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?					
5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?					
6. How often do you feel overly active and compelled to do things, like you were driven by a motor?					
7. How often do you make careless mistakes when you have to work on a boring or difficult project?					
8. How often do you have difficulty keeping your attention when you are doing boring or repetitive work?					
9. How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?					
10. How often do you misplace or have difficulty finding things at home or at work?					
11. How often are you distracted by activity or noise around you?					

Instructions: Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, place an X in the box that best describes how you have felt and conducted yourself over the last 6 months.	Never	Rarely	Sometimes	Often	Very often
12. How often do you leave your seat in meetings or other situations in which you are expected to remain seated?					
13. How often do you feel restless or fidgety?					
14. How often do you have difficulty unwinding and relaxing when you have time to yourself?					
15. How often do you find yourself talking too much when you are in social situations?					
16. When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?					
17. How often do you have difficulty waiting your turn in situations when turn taking is required?					
18. How often do you interrupt others when they are busy?					

(Kessler, et al., 2005)

Appendix B

Childhood Trauma Questionnaire

Instructions: These questions ask about some of your experiences growing up as a child and a teenager. For each question, circle the number that best describes how you feel. Although some of these questions are of a personal nature, please try to answer as honestly as you can. Your answers will be kept confidential.

	Never true	Rarely true	Sometimes true	Often true	Very often true
1. There was someone in my family whom I could talk to about my problems.					
2. People in my family criticized me.					
3. I didn't have enough to eat.					
4. People in my family showed confidence in me and encouraged me to succeed.					
5. Someone in my family hit me or beat me.					
6. I lived in a group or foster home.					
7. I knew that there was someone to take care of me and protect me.					
8. Someone in my family yelled and screamed at me.					
9. I saw my mother or one of my brothers or sisters get hit or beaten.					
10. People in my family called me things like "stupid," "lazy," or "ugly."					

	Never true	Rarely true	Sometimes true	Often true	Very often true
11. I was living in the streets by the time I was a teenager or even younger.					
12. There was someone in my family whom I admired and wanted to be like.					
13. My parents were too drunk or high to take care of the family.					
14. People in my family got into trouble with the police.					
15. There was someone in my family who helped me feel that I was important or special.					
16. I had to protect myself from someone in my family by fighting, hiding, or running away.					
17. There was someone in my family who wanted me to be a success.					
18. I had to wear dirty clothes.					
19. I lived with different people at different times (like different relatives or foster families).					
20. I believe that one of my brothers or sisters might have been molested.					
21. I felt loved.					
22. My parents tried to treat all of children the same.					
23. I thought that my parents wished I had never been born.					
24. I got hit so hard by someone in my family that I had to see a doctor or go to the hospital.					

	Never true	Rarely true	Sometimes true	Often true	Very often true
25. There was someone in my family who made sure that I stayed out of trouble.					
26. People in my family hit me so hard that it left me with bruises or marks.					
27. I had sex with an adult or with someone who was a lot older than me (someone at least 5 years older than me).					
28. There was someone older than myself (like a teacher or a parent) who was a positive role model.					
29. I was punished with a belt, a board, a cord, or some other hard object.					
30. There was nothing I wanted to change about my family.					
31. People in my family looked out for each other.					
32. People in my family said hurtful or insulting things to me.					
33. I believe that I was physically abused.					
34. People in my family tried to keep me away from bad influences.					
35. I got hit or beaten so badly that I was noticed by someone like a teacher, neighbor, or doctor.					
36. People in my family seemed out of control.					
37. People in my family encouraged me to stay in school and get an education.					
38. I spent time out of the house, and no one knew where I was.					

	Never true	Rarely true	Sometimes true	Often true	Very often true
39. The punishments I received seemed cruel.					
40. Someone in my family hated me.					
41. People in my family felt close to each other.					
42. Someone tried to touch me in a sexual way or tried to make me touch them.					
43. People in my family pushed me or shoved me.					
44. Someone threatened to hurt me or tell lies unless I did something sexual with them.					
45. I had the perfect childhood.					
46. I was frightened of being hurt by someone in my family.					
47. Someone tried to make me do sexual things or watch sexual things.					
48. Someone in my family believed in me.					
49. Someone molested me.					
50. I believe that I was emotionally abused.					
51. I believe that I was emotionally abused.					
52. I believe that I was sexually abused.					
53. My family was a source of strength and support.					

(Bernstein, Fink, Handelsman, & Foote, 1994)

Appendix C

Self-Injury Questionnaire

In the past 3 months, have you done any of the following to deliberately hurt yourself?

1. Cut yourself with a sharp object	0	1	2	3
2. Scratched yourself?	0	1	2	3
3. Hit yourself?	0	1	2	3
4. Burned yourself?	0	1	2	3
5. Picked areas of your body to the point of drawing blood?	0	1	2	3
6. Banged your head, arms, or legs to the point of bruising?	0	1	2	3
7. Pulled out your hair?	0	1	2	3
8. Chewed the inside of your mouth to the point of bleeding?	0	1	2	3
9. Hurt yourself while masturbating?	0	1	2	3
10. Cut, burned, or scratched your genitals?	0	1	2	3
11. Picked at wounds?	0	1	2	3
12. Carved words on your skin?	0	1	2	3
13. Other damage to your body?	0	1	2	3

Specify:

Table 1.

Crosstabulations Comparing Past-year Drug Abuse and Dependence by Drug Type Across Four Age Cohorts in A Sample Of 1,620 Psychiatric Outpatients

<u>Ages</u>	<u>Past-year Abuse (Yes/No)</u>	<u>Drug Type</u>											
		<u>Sedatives/ Hypnotics/ Anxiolytics</u>		<u>Cannabis</u>		<u>Stimulants</u>		<u>Opioids</u>		<u>Cocaine</u>		<u>Hallucinogens</u>	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
18-25	Yes	41 _a	3.0	344 _a	21.2	32 _a	2.0	60 _a	3.7	75 _a	4.6	51 _a	3.1
	No	322 _a	19.9	19 _a	1.2	331 _a	20.4	303 _a	18.7	288 _a	17.8	312 _a	19.3
26-35	Yes	39 _a	2.4	380 _b	23.5	43 _a	2.7	65 _a	4	147 _{b, c}	9.1	70 _a	4.3
	No	394 _a	24.3	53 _b	3.3	390 _a	24.1	368 _a	22.7	286 _{b, c}	17.7	363 _a	22.4
36-49	Yes	105 _b	6.5	492 _b	30.4	119 _b	7.3	99 _a	6.1	212 _c	13.1	85 _a	5.2
	No	477 _b	29.4	90 _b	5.6	463 _b	28.6	483 _a	29.8	370 _c	22.8	497 _a	30.7
50 +	Yes	38 _{a, b}	2.3	218 _{a, b}	13.5	45 _b	2.8	35 _a	2.2	60 _{a, b}	3.7	27 _a	1.7
	No	204 _{a, b}	12.6	24 _{a, b}	1.5	197 _b	12.2	207 _a	12.8	182 _{a, b}	11.2	215 _a	13.3
χ^2 (<i>p</i> -value)		< .001**		< .001**		< .001**		.74		< .001**		.36	

Notes. Chi-square analyses were used to compare past year drug abuse between Age Cohorts, within each drug type. Each subscript letter denotes a subset of Age Cohorts categories whose column proportions do not differ significantly from each other ($p > .05$).

** Statistical significance at the $p < .01$ level

Table 2.

Descriptive Characteristics Including Gender and Race by Age Cohort in a Sample With Past-year Substance Abuse and Dependence (N = 727)

Demographic Characteristics	Age Cohort									
	<u>Young Adult</u>		<u>Adult</u>		<u>Middle Age</u>		<u>Old Adult</u>		<u>Full Sample</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender										
Female	98	13.5	83	11.4	128	17.6	76	10.5	385	53.0
Male	83	11.4	64	8.8	111	15.3	84	11.6	342	47.0
Race										
White	157	21.6	127	17.5	209	28.7	147	20.2	640	88.0
Black	11	1.5	7	1.0	11	1.5	6	0.8	35	4.80
Hispanic	6	0.8	5	0.7	5	0.7	1	0.1	17	2.30
Asian	4	0.6	5	0.7	1	0.1	1	0.0	10	1.40
Portuguese	2	0.3	2	0.3	6	0.8	6	0.8	16	2.20
Other	1	0.1	1	0.1	7	1.0	0	0.0	9	1.20
Total	181	24.9	147	20.2	239	32.9	160	22.0	727	100

Note. This sample was split for confirmatory factor analyses (*N*= 577) and principal components analyses (*N*= 150).

Table 3.

Descriptive Characteristics Including Gender, and Race, By Age Cohort in The Subsample Used for Principal Components Analyses (N = 150)

Descriptive Characteristic		Age Cohort									
		<u>Young Adult</u>		<u>Adult</u>		<u>Middle Age</u>		<u>Old Adult</u>		<u>Full Sample</u>	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender											
	Female	16	10.7	20	13.3	30	20.0	19	12.7	85	56.7
	Male	14	9.3	11	7.3	23	15.3	17	11.3	65	43.3
Race											
	White	27	18.0	25	16.7	49	32.7	35	23.3	136	90.7
	Person of Color	3	2.0	6	4.0	4	2.7	1	.7	14	9.3

Table 4.*Exploratory Factor Structure of the Initial 30 Items in the CUSAPOS (N= 150)*

Scale Items	Factor Loadings			
	<i>M</i>	<i>SD</i>	Factor 1: Alcohol Problems	Factor 2: Drug Problems
63. I was intoxicated from alcohol.	1.03	1.187	.712	-
64. I drink alcohol more than I should.	.99	1.253	.855	-
65. Others complained about my drinking.	.45	.959	.656	-
66. I thought my drinking was a problem.	.68	1.076	.786	-
67. I had more than three drinks of alcohol in a day.	.99	1.232	.769	-
68. I thought about cutting down or stopping drinking.	1.05	1.375	.768	-
69. I tried to limit the amount of drinking I did.	1.15	1.407	.676	-
70. I tried to cut down or stop drinking.	.99	1.318	.682	-
71. I couldn't stop drinking when I wanted to.	.47	.995	.827	-
72. I had a strong urge to drink alcohol.	.92	1.256	.610	-
73. I drove after having two or more drinks of alcohol.	.57	1.089	.667	-
74. I was hung over from drinking alcohol	.58	1.070	.624	-
75. I drink alcohol during the morning.	.19	.642	.574	-
76. I drank alcohol even though it caused problems in my life.	.41	.928	.777	-
77. I felt guilty about my drinking of alcohol.	.56	1.096	.757	-
78. I was high on drugs.	.57	1.149	-	.791
79. I used street drugs.	.46	1.066	-	.723
80. I used drugs more than I should.	.45	1.114	-	.913
81. I thought that my drug use was a problem.	.35	.969	-	.849

Scale Items	Factor Loadings			
	<i>M</i>	<i>SD</i>	Factor 1: Alcohol Problems	Factor 2: Drug Problems
82. others complained about my drug use.	.37	1.019	–	.813
83. I thought about cutting down or stopping my drug use.	.57	1.239	–	.938
84. I tried to limit the amount of drugs I use.	.51	1.191	–	.855
85. I tried to cut down or stop my drug use.	.48	1.168	–	.834
86. I couldn't stop using drugs when I wanted to.	.31	.919	–	.803
87. I had a strong urge to use drugs.	.50	1.145	–	.816
88. I drove after using drugs.	.43	1.039	–	.772
89. I felt depressed after or paranoid after using drugs.	.29	.892	–	.617
90. I use drugs in the morning.	.35	.997	–	.643
91. I use drugs even though it caused problems in my life.	.34	.954	–	.835
92. I felt guilty about my drug use.	.49	1.169	–	.898

Note. Principal components analysis, with a promax (oblique) rotation, was the statistical method used to explore the factor structure of the total 30 items in the proposed CUSAPOS measure.

M= mean; *SD* = standard deviation.

Table 5.

Confirmatory Factor Structure and Factor Loadings of Items in the CUAPOS and CUDPOS

Scale Items	Factor Loadings			
	<i>M</i>	<i>SD</i>	Factor 1: Insight ^a	Factor 2: Behaviors ^b
CUAPOS				
64. I drink alcohol more than I should.	.99	1.25	.758	.144
65. Others complained about my drinking.	.45	.96	.801	-.046
66. I thought my drinking was a problem.	.68	1.08	.077	.827
67. I had more than three drinks of alcohol in a day.	.99	1.23	.811	-.008
70. I tried to cut down or stop drinking.	.99	1.32	-.169	.905
73. I drove after having two or more drinks of alcohol.	.57	1.09	.928	-.190
75. I drink alcohol during the morning.	.19	.64	.490	.226
76. I drank alcohol even though it caused problems in my life.	.41	.93	.574	.316
77. I felt guilty about my drinking of alcohol.	.56	1.0	.070	.807
CUDPOS				
78. I was high on drugs.	.57	1.15	.340	.542
81. I thought that my drug use was a problem.	.35	.97	.800	.140
82. others complained about my drug use.	.37	1.02	.937	-.092
85. I tried to cut down or stop my drug use.	.48	1.17	.637	.270
86. I couldn't stop using drugs when I wanted to.	.31	.92	.768	.130

Scale Items	Factor Loadings			
	<i>M</i>	<i>SD</i>	Factor 1: Insight ^a	Factor 2: Behaviors ^b
CUDPOS				
89. I felt depressed after or paranoid after using drugs	.29	.892	-.297	1.085
90. I use drugs in the morning	.35	.997	.916	-.269
91. I use drugs even though it caused problems in my life	.34	.954	.405	.570

Notes. Factor loadings that were confirmed with confirmatory factor analyses. Each scale shows a two-factor structure, and the number in bold indicates which factor that item loading appears to represent. Log transformation was used to correct normality of the distribution of scores across Age Cohorts.

M = mean score; *SD* = standard deviation

- a. Items reflect one's insight or self-awareness of substance abuse problems
- b. Items reflect behaviors associated with substance abuse problems

Table 6.*Goodness of Model Fit for the CUAPOS and CUDPOS by Age Cohort*

CUAPOS							
Age Cohort	Goodness-of-fit Indices						
	<i>N</i>	DF	CFI	TLI	RMSEA	SRMR	χ^2 (<i>p</i> value)
Young Adult	152	26	0.996	0.994	0.070	0.073	0.011
Adult	132	26	.999	0.998	0.051	0.080	0.144
Middle Age	201	26	1.0	1.0	0.014	0.044	0.410
Older Adult	139	26	1.0	1.0	0.016	0.074	0.417
Full Sample	624	36	0.997	0.995	0.064	0.046	> .001

CUDPOS							
Age Cohort	Goodness-of-fit Indices						
	<i>N</i>	DF	CFI	TLI	RMSEA	SRMR	χ^2 (<i>p</i> value)
Young Adult	152	19	1.0	1.0	0.0	0.043	0.58
Adult	132	19	1.0	1.0	0.0	0.033	0.868
Middle Age	201	19	1.0	1.0	0.0	0.026	0.981
Older Adult	139	19	1.0	1.0	0.0	0.070	0.722
Full Sample	624	28	0.972	0.958	0.081	0.031	> .001

Note. Confirmatory factor analyses showed good model fit across Age Cohorts for both scales.

N = number of participants; DF = degrees of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean error of approximation; SRMR = standardized root mean square residual

χ^2 (*p* value) = Chi-square test statistical significance at the $p < .05$ level.

Table 7.*Multigroup Confirmatory Factor Analyses for the CUAPOS and CUDPOS*

CUAPOS								
Model (M)	χ^2 (df)	CFI	TLI	RMSEA	SRMR	Model comp	$\Delta\chi^2$ (Δdf)	Decision
M1: Configural Invariance	348.99 (104)	0.914	0.881	0.128	0.054	--	--	--
M2: Weak/Metric Invariance	415.85 (125)	0.898	0.883	0.127	0.088	M1	66.86 (21)	Reject
CUDPOS								
Model (M)	χ^2 (df)	CFI	TLI	RMSEA	SRMR	Model comp	$\Delta\chi^2$ (Δdf)	Decision
M1: Configural Invariance	332.60 (76)	0.913	0.872	0.153	0.050	--	--	--
M2: Weak/Metric Invariance	389.96 (94)	0.900	0.881	0.148	0.094	M1	57.36 (18)	Reject

Note. Invariance test results show non-invariance in participant responses to items on both the CUAPOS and the CUDPOS, across Age Cohorts.

$\Delta\chi^2$ (Δdf) = Chi-square difference between M1 and M2 (degrees of freedom);
CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean error of approximation; SRMR = standardized root mean square residual

Table 8.*Descriptive Statistics and Correlations of the Study Scales*

Scale	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. CUAPOS	624	6.63	7.4	-				
2. CUDPOS	624	3.24	6.15	0.02	-			
3. Adult ADHD Self-Report Scale (ASRS)	326	35.39	12.67	0.02	.15**	-		
4. Self-Injury Questionnaire (SIQ)	515	2.04	3.56	0.04	.09*	.26**	-	
5. Childhood Trauma Questionnaire (CTQ)	544	106.78	45.88	0.01	-.09*	0.07	0.07	-

Notes. Table 8 shows significant correlations between scores on the CUDPOS and three other scales: ASRS, SIQ, and CTQ. The ASRS and SIQ also show a significant relationship.

n= total number of participants who completed the respective scale; *SD*= standard deviation; *M*= mean scores

** Correlation is significant at the $p < .01$ level

* Correlation is significant at the $p < .05$ level

Table 9.

Descriptive Characteristics for Gender, Race, and Mood Impairment by Age Cohort in a Sample Who Reported Substance Abuse Problems in the Past Week (N= 624)

Descriptive Characteristic		Age Cohort									
		<u>Young Adult</u>		<u>Adult</u>		<u>Middle Age</u>		<u>Old Adult</u>		<u>Full Sample</u>	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender											
	Female	80	12.8	71	11.4	104	16.7	67	10.7	322	51.6
	Male	72	11.5	61	9.8	97	15.5	72	11.5	302	48.4
Race											
	White	133	21.3	113	18.1	175	28.0	127	20.4	548	87.8
	Person of Color	19	3.0	19	3.0	26	4.2	12	1.9	76	4.8
Impairment/ Distress											
	No	91	14.6	57	9.1	100	16.0	66	10.6	314	50.3
	Yes	61	9.8	75	12.0	101	16.2	73	11.7	310	49.7
Total Sample		152	24.4	132	21.2	201	32.2	139	22.3	624	100

Notes. Crosstabulations describe the variables Race, Gender, and Mood Impairment by Age Cohort in a subsample who reported experiencing at least one alcohol or drug problem in the past-week. This subsample was used for analyses comparing mean scores on the CUDPOS and CUAPOS by Age Cohort, while controlling for Race, Gender, and Mood Impairment.

Table 10.*Comparisons of Mean Scores on the CUAPOS and the CUDPOS by Age Cohort*

Scale	0. Young Adult (N= 152)	1. Adult (N= 132)	2. Middle Age (N=201)	3. Older Adult (N=139)	ANOVA	Dunnett's C Test Results
	M (<i>sd</i>)	M (<i>sd</i>)	M (<i>sd</i>)	M (<i>sd</i>)		
CUAPOS	1.54 (.97)	1.52 (1.04)	1.62 (.96)	1.59 (1.02)	F (3, 620) = .368, <i>p</i> = .776	<i>ns</i>
CUDPOS	.96 (1.10)	.79 (1.16)	.65 (1.01)	.58 (.98)	F (3, 620) = 3.728, <i>p</i> = .011	0 < 2, 3

Notes. ANOVA results comparing mean scores on the CUAPOS and CUDPOS, show significant differences in self-reported drug abuse problems between the Young Adult and the Middle Age and Older Adult groups. No significant differences were found between Age Cohorts in alcohol abuse problems.

ns= non-significant; M= mean score; *sd*= standard deviation

Table 11.*Two-way ANOVA on CUDPOS Scores by Age Cohort by Gender*

Predictor	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>	Partial η^2
Intercept	341.92	1	341.92	308.03	.000	.333
Age Cohort	13.41	3	4.47	4.03	.007**	.019
Gender	8.35	1	8.35	7.53	.006**	.012
Age Cohort x Gender	8.29	3	2.76	2.49	.059	.012
Error	683.78	616	1.11			

Note. Two-way ANOVA results show a main effect between age and drug abuse problems, and gender and drug abuse problems.

** Statistical significance at the $p < .01$ level

Table 12.*ANCOVA on CUDPOS scores by Age Cohort While Controlling for Childhood Trauma*

Predictor	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>	Partial η^2
Corrected Model	11.980 ^a	4	2.995	2.609	.035*	.019
Intercept	62.326	1	62.326	54.304	.000	.092
CTQ ^b	1.358	1	1.358	1.183	.277	.002
Age Cohort	9.806	3	3.269	2.848	.037*	.016
Error	618.625	539	1.148			

Note. ANCOVA results suggest that childhood trauma is a covariate that significantly influences the relationship between CUDPOS and Age.

a. R Squared = .019 (Adjusted R Squared = .012)

b. Childhood Trauma Questionnaire (CTQ) scores were log transformed

* Statistical significance at the $p < .01$ level

Figure 1.

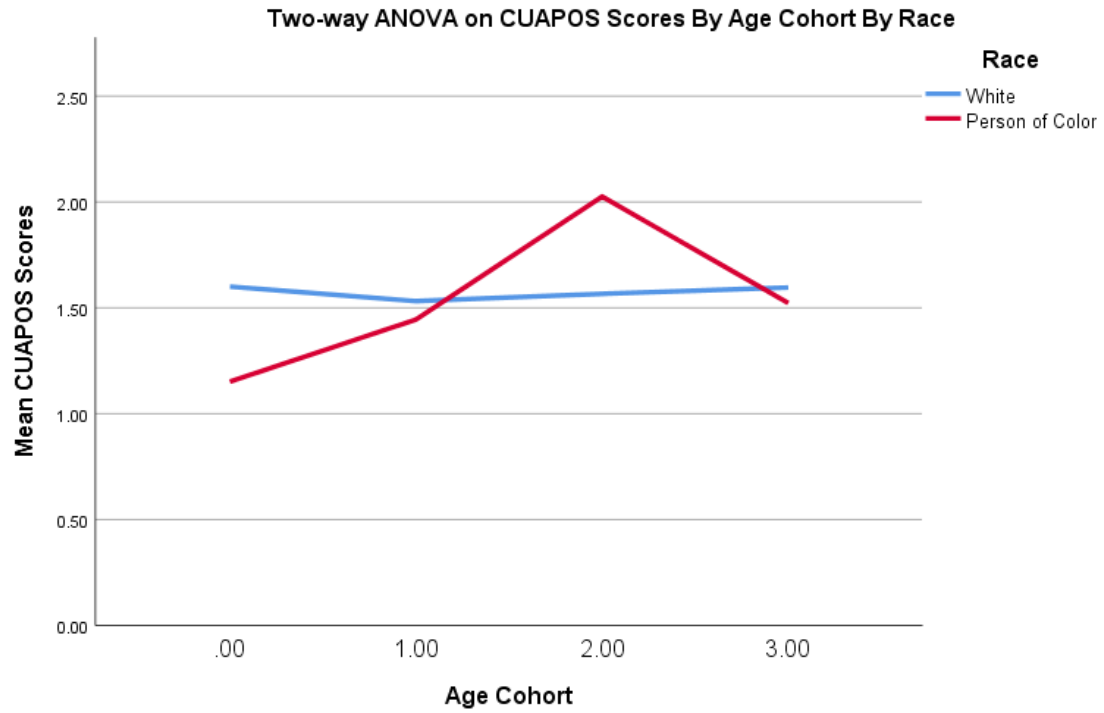


Figure 1. A two-way ANOVA showing a significant interaction effect between Age Cohort and Race on mean scores on the CUAPOS. Scores were log transformed to meet statistical assumptions for ANOVA.